THE "BRIDGE" TO THE FLEET: MATERIAL READINESS KEY TO WARSHIPS READY FOR TASKING

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It is the capacity for maintenance that is the best test for the vigor and stamina of a society. Any society can be galvanized for a while to build something, but the will and the skill to keep things in good repair, day in and day out, are fairly rare.

Eric Hoffer
***Working and Thinking on the Waterfront - A Journal, June 1958-May 1959*, Entry for 7 July 1958**

Perspective

The U.S. Surface Navy faces daunting material readiness challenges that have manifested themselves across several classes of ships. Numerous Navy-initiated assessments, particularly the high-level Fleet Review Panel of Surface Force Readiness,[2] and independent reviews have focused on maintenance issues and underscored the need to concentrate increased attention and resources on the current and future health of the Surface Fleet.

These challenges have been fully recognized by Navy leadership. Admiral John Harvey, Commander, Fleet Forces Command, noted in mid-2010, "…there is no doubt we are ready today. It is our overall readiness trends, however, that remain in the wrong direction…."[3] In January 2011, the Vice CNO, Admiral Jonathan Greenert, told a Surface Navy Association (SNA) audience: "We've got to sustain the fleet. We've had a decade of higher optempo than we anticipated and we planned for, and that has taken its toll. We have got to get to the expected service life of our units."[4] And, in his "Guidance for 2011," Chief of Naval Operations (CNO) Admiral Gary Roughead bluntly stated that the Navy "must maintain the Fleet we have to the end of its expected service life" because, in an increasingly resource-constrained budget environment, "there is

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no option, the Navy will work more efficiently."[5]

As a result of this greater attention on readiness gaps, a host of near- and long-term corrective actions have been implemented and new processes are being put in place to ensure the material readiness of today's and tomorrow's fleet is sustained.

For example, in 2009 the Navy established the Surface Ship Life Cycle Management (SSLCM) Activity to develop a more technically robust and longer-term emphasis on surface force readiness. The SSLCM Activity addressed specific maintenance and modernization actions required for each warship class and ascertained where each individual ship stood in relation to that notional baseline.[6] The SSLCM Activity proved so successful that Navy leaders quickly approved plans to elevate its work into a new, far larger and more comprehensive organization, the Surface Maintenance Engineering Planning Program (SURFMEPP).[7]

The Navy officially established this new entity—which represents far more than a simple change in name—on November 8, 2010 at the Norfolk Naval Shipyard. Indeed, SURFMEPP legitimizes the vital and significant revolution underway in surface ship maintenance and symbolizes the growing partnership between the Naval Sea Systems Command and Fleet Forces Command.[8] SURFMEPP is closely modeled after a similar organization—SUBMEPP—that has proven highly successful in adroitly managing submarine maintenance and modernization activities for more than 40 years.[9] SURFMEPP will be part of NAVSEA's SEA 21 directorate—the Deputy Commander for Surface Warfare—although it will be based in Norfolk, Virginia.

VCNO Admiral Greenert noted that SURFMEPP will bring more analytical rigor to maintenance, but an even more disciplined maintenance culture was needed to permeate every level—from sailor to Flag officer.[10] "If we don't have that then we won't get there," Admiral Greenert underscored at the 2011 SNA event. What is needed is a focused life cycle maintenance system to get to expected service life, adding that this was absolutely necessary, as it was the "keel" of the U.S. Navy's 30 year shipbuilding program. Looking ahead, the VCNO concluded that there would be even greater need for a rigorous maintenance framework, as the Navy adds more than 80 new ships in 13 classes to the operating forces in the next decade. Effectively managing the life cycles of these new ships and the in-service ships they join will be key to meeting near- and far-term force-structure needs.

To jumpstart SURFMEPP efforts, there is burgeoning cooperation—the sharing of lessons learned and broadened communication—between the new surface organization, SUBMEPP and the Navy's Aircraft Carrier Planning Activity, a similar organization that has proven to be equally as successful over time as the SUBMEPP organization. In late 2010, the Navy formed a de facto alliance to link these three organizations into a coherent and technically skilled voice for maintenance across the entire Navy. Efforts are now underway to forge an integrated relationship across these three naval enterprises to ensure seamless collaboration, with more knowledge generated and communicated, costs shared, and common business practices jointly executed.[11]

Today's readiness challenges, while troubling, do not imply that the U.S. Navy is not ready to undertake the missions directed by the President. About 60 percent of the fleet is underway on

any given day and fully 43 percent of the force is forward deployed. Both of these statistics represent historically high percentages.[12] In addition, while the overall size of the Navy has decreased by 18 percent since 2000, the service has been able to keep the number of ships deployed at a steady, if not historically high, level. The Navy has been able to achieve and maintain this high deployment rate and operational tempo (optempo) by altering its maintenance plans and focusing on getting ships underway, rather than worrying about the long-term impacts of deferred maintenance and excessive use.[13] Thus, while short-term, "get the ship deployed" readiness requirements have been met, doing so has created a bow-wave effect of deferred longer-term readiness needs—which has resulted in foreshortened expected service lives for some ships. Navy leaders are now reassessing the cost and material impact of these deployment decisions, and the hazard of this mindset of meeting all overseas commitments. As Admiral John Harvey recognized, "We can't do everything all the time and still sustain the fleet. There's a balance you have to reach."[14]

The material readiness challenge facing the Surface Navy in 2011 is the result of the cumulative impact of nearly two decades of disparate actions and decisions resulting in reduced ship manning, less shore-based training, and a far leaner support maintenance infrastructure ashore.[15] These decisions, often made in isolation as to how they might impact other parts of the Navy, did not account for the far higher optempo that the service routinely maintains today—and has been operating at since the tragedies of September 2001. This higher optempo erased or greatly circumscribed the expected efficiencies to be gained by reducing manning and thinning the size of the Navy's shore-based maintenance organizations. As a result, the material readiness of the surface force has borne the brunt of the negative impact of this higher operations tempo and reduced manpower and support infrastructure. As another result, readiness challenges have grown.

In 2010, Navy officials stated it would take at least two years, despite the positive changes begin implemented, before current readiness trends start to be reversed and the overall situation improves. As Admiral Harvey explained, "My timeline is to turn these trends in two years. Increased funding in fiscal years 2011 and 2012 [is] critical."[16]

Material Readiness Defined

There are many definitions of what "readiness" truly means. Standard dictionaries, for example, often list five or more definitions of the word. These span a wide universe, ranging from ***being prepared*** to ***act with promptness and quickness***. For the Navy, however, readiness is not a term that can be expressed in a simple, all-encompassing sentence. It is generally regarded as a positive, in that military readiness is a good thing to possess, with little comprehension of what this means in concrete terms. In a sense, this "readiness nirvana" is a chimera, since too many competing and complex variables interact in various ways and at different times, all of which contrive to impact readiness. The search for an ideal readiness state is thus not "valid when it comes to understanding how the various elements of readiness in a large force relate to each other over extended periods of time," as Richard Betts of the Brookings Institution recognized more than a decade ago.[17]

For the Navy, material readiness generally refers to the overall "health" of a warship, vessel or craft to carry out required missions and tasks successfully and safely. It is somewhat of an arcane science—perhaps an art form—that takes into account the maintenance, modernization and general upkeep of the hundreds of systems, components and parts that are deployed, embedded and integrated into every ship. Each of these parts or components, and whether they are working at prime efficiency or not, then contributes to the overall material readiness health of a ship. While the individual impact of any part not operating at peak performance would be minimal on a ship's readiness, as these individual parts collectively underperform over time, the cumulative impact generates negative impacts on a ship's operational proficiency and mission effectiveness. In short, the "whole" of readiness is more than the sum of its individual "parts." But the individual parts are critical to the sum of overall readiness.

Readiness hinges on four critical areas, all of which are interrelated, and these are the primary areas that Navy leadership is now focused on to strengthen overall material readiness of the service's surface force. All of these issues have contributed to the downward trend in surface readiness and have increased the cost to operate and maintain the service's ships. The four key areas are as follows:

The right number of highly trained and qualified personnel. A lack of sufficiently trained sailors has led to a situation where maintenance and repairs that were once routinely performed on board ship can now be done only ashore. Crews have become accustomed to shipboard systems either not working or working at less than optimal levels. This proliferation of "exceptions to the standards" has created a surface fleet culture that accepts and expects to do less with less.[18]

Equipment that is kept in "tip-top" condition by proper operation and maintenance. The dearth of trained personnel has led to subpar equipment health across the surface fleet, which in turn has dramatically ratcheted-up Navy operations and maintenance costs now required to restore equipment to proper standards and ensure it reaches its full service life.

Ships that are properly supplied with adequate inventories of spare parts. The lack of certain types of spare parts, for example, replacement voltage regulators for the Aegis SPY-1 radar, compromised performance of the Aegis radar and combat system, but not to such an extent that the ship could not operate. Over time, however, this lack of spare parts and the knowledge that parts were not available fleet wide has created a culture where deviating from technical standards was the norm rather than the exception.[19] Correcting these ingrained mindsets will take time to change and will not be cheap. This is clearly an area in which "putting the Navy's 'money' where its 'mouth' is" will be critical to success.

Training programs that are effective and responsive to dynamic needs. Too much emphasis was placed on self-training and on-the-job training, while at the same time critical shore-based schools and other specialized training programs were either curtailed or eliminated in the drive to reduce the overall size of the Navy since the early 1990s. The result has been that officers and enlisted personnel who arrive aboard ship are lacking critical skills or training to maintain and operate ship systems at peak efficiency.[20] This situation has contributed to increased maintenance costs and equipment that is degraded before its service life expires.

These are critical factors that define proper readiness overall. But readiness is not a universal process applied equally across every ship in the Surface Force. There are different categories of readiness that exist and each of these categories is applicable to a ship and its crew depending on whether it is preparing to deploy overseas or has just returned from a mission. Specific timeframes are important here. Equally important is which Navy organization maintains responsibility for readiness of a ship, since that changes depending on a ship's progression along the readiness timeline. In general, however, there are three specific stages of readiness that a ship undergoes. These overlapping stages require a continual dialogue between naval officials across all three of these readiness domains. These are:

Current Readiness: Zero-24 Months. This is the purview of the ship's commanding officer and relates to those elements and issues most salient to ensuring the warship can deploy to meet Combatant Commander requirements. The timeframe for this segment of the readiness spectrum is zero-to-24 months. It can include such issues as ensuring spare parts lockers are full, all crew training is up-to-date and completed, and all inspections have been documented and successfully passed.

Near-Term Readiness: 20-27 Months. This area is primarily the responsibility of the Fleet Type Commander, who controls the funding for those other maintenance and corrosion control programs for ships undergoing periodic maintenance availabilities. The timeframe for this segment begins 20-to-27 months before a ship is scheduled to deploy.

Future Readiness: 24 months and beyond. This area is all about the future health and modernization of the Surface Force. This segment is the purview of NAVSEA's SEA 21 Directorate and has a 24-month and beyond horizon. SEA 21 addresses all of the elements that impact future readiness and serves as the single point of contact for synchronizing the other entities across NAVSEA and other Navy organizations. This also includes the addition of new technologies or the introduction of upgraded weapon systems, combat systems and other equipment designed to improve ship performance and missions.

"Readiness is about good life-cycle support management," Rear Admiral James McManamon noted at the January 2011 SNA conference.[21] "That means we must have a consistent message, consistent resources, and a program that allows us to use those resources as needed."

Importance of Service Life

Readiness and ensuring that all ships are properly maintained is inherent in protecting the service lives of Navy ships. Service life is acutely important and growing more so every year in order to maintain the viability of the future fleet. In fact, the future size of the U.S. Navy, its total number and proper mix of ships, is directly related to ensuring a healthy level of material readiness today, as Sean Stackley (Assistant Secretary of the Navy, Research Development and Acquisition) underscored in September 2010: "To get to 313 ships we have to get the full service life out of every ship today, and where prudent, get extra life out of some classes of ships."[22] Reduced readiness exerts a negative impact on the overall service life of a ship.

With the U.S. Navy unlikely to attain robust shipbuilding rates into the future, it is an absolute imperative that the service squeezes as much service life as possible from every ship already in the fleet today. Fully 220 of the 286 or so ships in service in late 2010 will still be in service in 2020. "Seventy percent of the 313-ship force out there in 2020, we own today," Vice Admiral Kevin McCoy, Commander, Naval Sea Systems Command, noted at the 2011 SNA symposium.[23] "Our challenge is, at the same time we're trying to build 50 to 55 ships over the FYDP [Future Years Defense Plan], … to carry along with us—well into the 2020 to 2030 timeframe—the ships we already have. Therein lies the dual challenge. We cannot just build our way into 313 ships."

Simply to grow the fleet to 313 ships, which Navy officials have emphasized is the "floor" of the future force not the "ceiling," the service must ensure that every ship meets its projected service life—sometimes 40-years or longer. CNO Admiral Roughead has repeatedly emphasized that "every commanding officer and every sailor must keep that in mind. Without force structure we will not be a Navy, and once it declines it is gone...."[24]

This means that material readiness is assuming an even more important role in determining the future health—and size—of the U.S. Navy. How this imperative will evolve is far from clear. The Navy has little recent experience in attaining full service lives of its surface ships. For example, surface combatants with programmed 35-year service lives on average were retired at just 26 years. (Perhaps the most telling example of this was the early retirement, at approximately 18 years of service, of the first five "Baseline 1" Aegis guided-missile cruisers due to cost and operational capabilities issues.) In the past, this was because the ship's combat systems would be rendered obsolete long before a ship's hull was deemed worthy of scrapping. Now, with the widespread adoption of open system architectures for combat systems, the "heart and brains" of a ship's combat system can be repeatedly upgraded with new software as threats, software and system capabilities evolve.

So, the pacing element going forward on service life is the overall health and maintenance of the ship's hull, mechanical, electrical (HM&E) and other machinery systems. "Getting 30 years out of ships is not something the Navy has practiced with any regularity," Rear Admiral Thomas Eccles, the service's chief engineer, warned in September 2010.[25] "It is not an automatic that we will get the full life out of our ships," he admitted. The bottom line, however, is that the service no longer has the luxury of pushing required maintenance off into the indefinite future in order to deploy ships today.

Again, the Navy's current readiness challenges should not imply that the service is not capable of meeting today's operational demands. There is strong evidence that the Navy's current readiness is adequate and that current readiness challenges are not significantly affecting today's operations. This fact is clearly seen in the alacrity of the service's various responses to major world events during the last year.

Following the devastating earthquake in Haiti in January 2010, for example, the Navy surged 11 ships to the island nation after issuing a "no notice" deployment order. Significantly, one of the first Navy ships on scene was the Aegis guided missile destroyer *USS Higgins* (DDG 76), which had returned from a lengthy deployment from the Pacific and subsequently conducted

ballistic missile defense missions in the Mediterranean Sea. In September, the *USS Kearsarge* (LHD 3) amphibious ready group deployed a month early in order to provide badly needed food, medical assistance and helicopter transport to Pakistan in the wake of horrendous flooding that had left millions of civilians homeless. The *Kearsarge* deployment followed that of the *USS Peleliu* (LHA 5) amphibious ready group, which was the first naval unit to respond to the Pakistani humanitarian crisis. The Navy's adept response to these no-notice missions demonstrates none of the telltale signs of an unready force.[26]

Fleet Review Panel (FRP)

Concerned about the overall health of the Surface Force based on the anecdotal information emerging from fleet reports and assessments on the negative status of individual ships, senior Navy leaders commissioned a high-level study in September 2009 to ferret out exactly how significant the current readiness challenges were and what was driving their seemingly rapid growth. Convened by the Commander, Fleet Forces Command, and Commander, U.S. Pacific Fleet, the group was officially termed the Fleet Review Panel of Surface Force Readiness (FRP), led by Vice Admiral Philip Balisle, former head of the Naval Sea Systems Command. The panel provided a list of 36 specific recommendations to Navy leaders, all of which would significantly boost readiness, particularly if implemented as a single, whole package, as urged by the panel.

The report concluded there was no single cause or issue driving surface readiness challenges. Moreover, the report served as a catalyst to focus senior Navy leadership's attention on the readiness issue and spawned numerous corrective actions. In great detail, the FRP report laid out the root causes and multiple factors, some stretching back more than two decades, responsible for breaking the Surface Fleet's "Circle of Readiness." This term refers to the seven areas that constitute sound operations and maintenance. These are: (1) material readiness; (2) manpower and manning; (3) training; (4) organization; (5) command; (6) culture; and (7) financial management. No single issue from this list predominates. The report notes that these areas are systemic in their impact and cannot each be looked at in isolation from one another. When operating together they comprise a synergistic "Circle of Readiness." What brought readiness to its current state, the report concluded, was the overall impact of many discrete, often unrelated decisions based on budgetary and organizational assumptions at various points in time, many of which never materialized as planned, but all of which helped contribute to the current crisis. "It appears the effort to derive efficiencies has overtaken our culture of effectiveness," the FRP concluded. "Current processes and resources in place are insufficient to arrest the downward trend."[27]

The FRP also devoted considerable attention to understanding why the Navy's submarine and aircraft carrier communities are not experiencing anywhere near the magnitude of readiness issues that are challenging the Surface Force. The report concluded that the culture regarding maintenance in the submarine and aircraft carrier organizations is the standard to which the surface force community should strive.

When it comes to nuclear-powered submarine and carrier maintenance, for example, the Navy rarely, if ever, deviates from established plans. These plans are considered sacrosanct, given the dire implications should a critical part or system fail on a submerged submarine or a

carrier conducting aircraft landings in difficult seas. Longevity is important, too. For example, the organization guiding overall submarine maintenance and health is now into its 43rd year of continuous operation. As the FRP noted, "In a business where actions taken and resultant effects are often separated by years, consistency is a valuable quality, a quality sorely missing in the surface warfare enterprise."[28]

Going forward, surface warfare leaders have determined the Surface Force requires organizations similar to those that support the long-term planning and maintenance for the Navy's submarine and aircraft carrier communities. Indeed, what has heretofore been lacking for surface ships is a central organization responsible for the long-term health, maintenance and modernization of all ship classes. The submarine and aircraft carrier communities have long-established organizations whose sole purpose is to ensure the tight integration of maintenance schedules with resources, and to closely track changes over time. This process then accounts for the overall impact of any resource reduction across submarine or carrier maintenance plans and determines their implications for the health of the fleet.

Top-Level Champions

The good news emerging from today's readiness challenge is that the Navy's leadership is firmly committed to ensuring the material readiness of the surface force. From the Chief of Naval Operations and Navy headquarters staffs, to Fleet Commanders who operate these ships, to the Naval Sea Systems Command that is responsible for their acquisition and upkeep, there is now a singular focus on creating a new mindset regarding long-term maintenance that is focused on achieving expected service lives, and thereby instituting a new culture of readiness excellence. Nothing less than the future of the Navy is at stake in this process of "reinventing surface maintenance," and senior officials realize that success is the only option. "This is a daily battle," Vice Admiral McCoy noted in September 2010. "If we don't do this successfully then the shipbuilding plan will go away. We will not get to 313 ships."[29]

Senior Navy leaders now meet on a regular basis, at both the Fleet and Service levels, to better understand the overall state of surface readiness and to gauge the impact of new systems and processes as they are being implemented. The Chief of Naval Operations is now briefed on a regular basis on the state of surface readiness and has singled out readiness as a critical issue in his 2011 Guidance. This reinvigorated attention to readiness is a marked change from the service's previous focus, which was on simply ensuring that ships were ready for deployment to meet Combatant Command tasking. It is a welcome sea change.

For example, Admiral John Harvey, Commander Fleet Forces Command, and Admiral Patrick Walsh, Commander U.S. Pacific Fleet, are now the co-leaders of a new Fleet Integration Executive Panel, whose purpose is to serve as the integrator for "readiness planning, reporting, risk management and execution," between the service's Atlantic and Pacific-based forces.[30] This new organization replaces the existing Fleet Readiness Enterprise that had become unwieldy and slow to address integration issues across five separate warfare areas. Now its focus will be on integration across two fleets. "Readiness is my top issue every day," Admiral Harvey emphasized to Congress in his 2010 testimony.

Other new processes should ensure that senior leadership remains focused on readiness issues for the long haul. Vice Admiral McCoy now updates Admiral Harvey every 60 days on the readiness plan implementation and how specific readiness issues are being addressed across ship classes.[31] In addition, in 2010 the Navy created a new Fleet Readiness Panel that includes a Senior Leadership Oversight Council. Co-led by the deputy commanders of Fleet Forces Command and U.S. Pacific Fleet along with the Director, Navy Staff, this new entity's primary mission is "on ensuring that conventional surface ships can reach their expected service life."[32] The council's work will extend into all of the manning, training, equipment and maintenance domains related to surface warfare, with active participation of the principals considered a bedrock requirement.

Standards Matter

To attack this challenge, Navy leaders are employing a combination of new and different approaches. First, there is a renewed commitment to standards of excellence in maintenance—boosting the culture, training and education efforts required to ensure that standards are effectively implemented and followed. Second, in its quest to meet ever-increasing operational demands from Combatant Commanders, whose demand signals are often not directly linked to resource-allocation decisions, the Navy, in recent years, has sacrificed near-term maintenance opportunities in order for ships to deploy quickly to meet emergent needs. Partly this can be done because surface ships can accept more risk in operating than either submarines or carriers.[33] While certain systems may not be operating at 100 percent effectiveness, the ship can still deploy and carry out a significant percentage of its assigned missions.

One consequence of the approach to always responding to any deployment request is that not adhering to standards gradually became "business as usual" across much of the Surface Fleet, with a generation of officers and sailors accustomed to operating in an environment where standards had been routinely waived or compromised. Leaders are now working to get the Surface Force back to its "roots" and strong adherence to "time-tested standards of performance, reliability and effectiveness," in Admiral Harvey's perspective.[34] Loosening standards created an accumulated maintenance burden across the surface force, which was becoming counterproductive, and resulted in a greatly reduced service life for the ship.

Boosting Resources

In addition to tightening standards and injecting new cultural priorities into the Surface Force, substantial resources are being earmarked to fix the current backlog of maintenance and repairs looming across several ship classes. The issues facing the surface force are so large, however, that the current list of ills cannot be corrected with a one-time dose of extra funding. This situation will take years to restore a proper balance and even then will require a continuing commitment to ensure more effective ship maintenance into the future. That said, significant additional funding is coming. The Navy leadership allocated $5.2 billion for ship operations and maintenance funding in fiscal year 2009, while $5.3 billion was approved for fiscal year 2010. This number is expected to increase to $6.1 billion in fiscal year 2011.[35]

The additional funding is flowing to surface warfare in part because there has been a marked improvement in the detailed data being submitted to Navy budget officials that more clearly justifies how, why and where the maintenance funding will be spent. Based on efforts initiated under SSLCM Activity, budgets are being better informed by providing integrated, technically validated maintenance plans for surface ships by specific classes. SURFMEPP is now leading the effort in developing several core lifecycle planning, budgeting, and work package execution documents designed to achieve the expected service life for non-nuclear surface ships. One of the primary SURFMEPP engineering products influencing future surface maintenance funding requirements are Technical Foundation Papers (TFPs), which feature sound engineering rigor, vice prior Surface Navy maintenance requirements generation processes relying on historic averages. SURFMEPP has completed TFPs for destroyers (DDGs) and amphibious transport dock ships (LSDs), resulting in significant increases in out-year maintenance requirements, and is continuing efforts on cruisers (CGs) and amphibious assault ships (LHAs and LHDs) to inform outyear budgets. The remaining surface ship classes are planned to have TFPs completed by fiscal year 2014, thus enabling Navy to adjust associated maintenance requirements for all surface classes by fiscal year 2016.

Manpower Surge

Another critical piece in restoring surface force readiness is the need to re-deploy more dedicated manpower on board ships and at various maintenance facilities ashore. Navy leaders are committed to moving additional technical specialists in coming years into critical billets that have experienced shortfalls. As the Navy transitioned to minimal, as opposed to optimal, manning on ships and several rounds of consolidation of shore-based maintenance and training facilities during the last decade, critical shipboard and shore-based skills were inadvertently lost. The success of optimal manning hinged on certain planning assumptions coming true, and when those assumptions proved illusory, the overall program was not recalibrated.[36] The FRP and other internal Navy documents have chronicled how manpower shortages contributed to current readiness challenges and the role these manpower shortfalls have played as a contributing factor in declining maintenance standards, the burgeoning backlog in the repair of critical electronic components, and the lack of certain essential spare parts for some systems in the supply chain.

For example, the FRP notes that when the Navy adopted an optimal manning strategy in 2001, it was based primarily on the number of personnel required to adequately carry out shipboard watch standing and operational issues—other factors like maintenance requirements were not explicitly considered. Moreover, reductions in manpower did not account for the average 8.4 percent of personnel who were "lost" to a ship's crew as a result of medical, illness, training or Individual Augmentation requirements elsewhere. Overall, optimal/reduced/ minimal manning culled more than 4,000 sailors from surface ships so that by 2009 the average DDG 51 destroyer had a crew of 254 officers and enlisted personnel, far fewer than the 317 crew members on board each destroyer in 1998.[37] The net result of these personnel reductions on ships and ashore is that the surface force could no longer maintain minimum standards of materiel readiness.

Optimal and particularly minimal manning on ships depends on having a robust shore-based maintenance capacity to compensate for the reduction of personnel on board. As the FRP fully

documents, shore facilities that supported fleet maintenance were reduced to levels too low to support the optimum manning initiative. Regional Support Organizations were disestablished in 2006, causing more maintenance work to be shifted back on board ships to be performed by already reduced crews. The FRP noted, "As we were downsizing ship crews, we were pushing more repair work back to the ship."[38] In addition, corrosion control teams were to have been established to supplement reduced crew size in order to continue attacking this endemic issue on all ships. But those special teams never materialized.

Now, Navy leaders recognize that the optimal/reduced manning initiatives may have removed too many critical sailors from ships and took too many skilled technicians out of critical shore-based maintenance facilities. To correct these personnel deficiencies, the Navy intends to add more Fire Control men to destroyers and cruisers; boost the number of Engine men on landing ship dock ships (LSDs) and LPDs; and increase the number of Machinist Mates assigned to amphibious assault ships.[39] It should be emphasized, however, that this surge in personnel on board ship and into shore maintenance billets does not mean the Navy is adding personnel above its congressionally authorized strength of 324,000 personnel. Rather, these people will come from elsewhere in the service. CNO Admiral Roughead expects this surge to total about 6,500 sailors and that it will take place incrementally during the next five years (through 2015) as the Navy moves skilled personnel back into these critically short shipboard billets.[40]

Best-Practice Teaming with ABS

Beginning in July 2008, NAVSEA entered into an experimental pilot program with the American Bureau of Shipping (ABS) to conduct an independent survey and assessment of the corrosion issues on surface ships based on long-established ABS procedures for any classed vessel. To initiate the effort, one ship from four different classes of Navy ships was selected to undergo the ABS assessment process. Ships participating in the pilot effort were the USS *Germantown* (LSD 42), USS *Cole* (DDG 67), USS *Underwood* (FFG 36), and USS *Mobile Bay* (CG 53). The end result was a better understanding of the current condition of the ships and greater technical insight into the life expectancy of both critical shipboard components and the overall health of the ship itself. ABS assessments revealed that only 64 percent of *Germantown*'s structure was in good condition, compared to 83 percent for the USS *Cole*.[41]

The initial pilot program was so successful that Navy officials expanded the ABS assessment to 11 ships in fiscal year 2010, including two ships from two new classes that were not part of the original pilot project: the USS *Boxer* (LHD 4) and USS *New Orleans* (LPD 18).[42] In addition, the ABS assessments will now migrate into a tool to be used in the formulation and development of maintenance and budget plans for each specific ship. The ABS assessments will be managed by the new SURFMEPP and incorporated as a baseline for inclusion in other readiness processes such as Comprehensive Maintenance Plans (CMPs), Technical Foundation Papers (TFPs), and Baseline Availability Work Packages (BAWPs). In fiscal year 2011, the Navy intends to dramatically expand this ABS assessment tool to the survey process for 140 surface ships. "These third-party assessments have been hugely successful," Rear Admiral McManamon noted in September 2010.[43] The focus going forward is to use the ABS assessments on hull structure and critical distributed systems on ships such as scantlings,

deckhouse, tanks, air conditioning systems, the electric plant, fire main and chilled water systems.

Readiness Task Forces

To jumpstart corrective actions, and holistically engage all organizations affected by surface warfare material readiness issues, Surface Navy officials have put in place four special-focus task forces. Established during 2009-2010 at the direction of the Commander, Fleet Forces Command, and Commander, U.S. Pacific Fleet, these task forces have proven invaluable in getting to the heart of the readiness issues that cut across a ship class. They enable expertise residing in different commands and organizations to work together and focus on specific problems for a short, intense period. The task forces assess the issues and provide a set of practical recommendations over a six to 12-month timeframe. They have proved particularly adept at breaking down institutional barriers because their unique cross-functional nature encourages knowledge sharing and insight into issues—regardless of where the information originates. While established by Fleet commanders, the task forces' daily operations are led by the Naval Sea Systems Command's SEA 21 organization.

During 2010, four separate task forces were established to assess specific readiness issues. Each of the task forces has been charged to undertake a holistic assessment of its given area and propose a series of actionable recommendations to improve current readiness and sustain those improvements into the future. Three cross-functional working groups—(1) sustainment, (2) integrated logistics system and (3) manpower, personnel, training and education—comprise each of the task forces. Each assessment is broken into five distinct phases. Since the individual task forces were all established at different times, in early 2011 they reside at different points along the phase timeline. The specific phases are:

- Phase 1 (Define): establish a readiness task force
- Phase 2 (Measure): capture and analyze the current state of readiness data
- Phase 3 (Analyze): develop a series of actionable recommendations
- Phase 4 (Improve): prepare final report and plan of action and milestones
- Phase 5 (Control): manage the implementation of recommendations

Through the end of 2010, SEA 21 has implemented four readiness task forces.

Aegis/SPY Radar Readiness Task Force. This task force was the first to be established and has served as a template for subsequent task forces that have been formed to assess other readiness issues impacting other ship classes. The Commander, Naval Surface Forces, stood up the Aegis/SPY task force in October 2009 to undertake a comprehensive readiness assessment of all versions of the SPY-1 radar and the Aegis weapon system and provide recommendations to correct readiness deficiencies. The task force completed its work in April 2010 and developed a comprehensive list of 48 recommendations, prioritized into three areas: (1) those that improve ship self-sufficiency; (2) those that improve shore-based support; and (3) the implementation of periodic assessments of shipboard readiness. The total cost of the must-do list of actions from fiscal year 2010 to 2017 was estimated at $247.6 million.[44]

The task force concluded that numerous underlying issues contributed to the declining state of Aegis/SPY readiness. Core issues included lack of manning and technical expertise on board ships; multiple reductions in training have rendered crews unable to troubleshoot equipment problems; spare parts shortages and inadequate spares allowances per ship have undermined the mission; and distance and onsite technical support was not always sufficient to correct issues. Both the NAVSEA Commander and Deputy Commander SEA 21 endorsed and supported the task force's findings and urged their quick and thorough implementation.

Mine Countermeasures Ships Readiness Task Force. The purpose of this task force is to conduct a coordinated, comprehensive readiness assessment of the service's fleet of *Avenger* (MCM 1)-class mine countermeasures ships and issue a set of recommendations to improve their readiness. The task force was directed by Commander, Naval Surface Forces, and is being co-led by SEA 21 and Commodore, MCM ships. Four areas have been singled out for emphasis by the review. These are: (1) manpower and personnel; (2) training; (3) integrated logistics support; and (4) sustainment. The goal is to focus on the "root cause factors" impacting readiness and identify both actions and resources to effect long-term improvements.[45]

With the *Avenger* class averaging greater than 20 years of age in 2010, the Navy faces numerous challenges in sustaining the service life of these ships until they are replaced by the Littoral Combat Ships (LCSs) equipped with MCM modules after 2017. Given the age of hulls and equipment, the *Avenger* class faces increasing maintenance issues and lack of spare parts for a growing list of obsolescent systems. The task force is assessing MCM ships in part to determine what would be required if a service life extension program were to be initiated in order to keep several of these ships in service beyond their anticipated 2017 decommissioning date. The MCM mission is critical in future crises and conflicts, as Admiral Roughead noted in June 2009: "Successful mining of the sea lanes of communication is a show-stopper."[46] Since the end of World War II, for example, mines have seriously damaged or sunk four times more U.S. Navy ships than all other means of attack. To help this task force succeed, it will have two parts, an integrated working group and an assessment team, which will take in and analyze all of the data collected by the working group.

LPD 17 Class Wholeness Task Force. Directed by the Commander, Fleet Forces Command, and Commander, U.S. Pacific Fleet, this task force is to undertake a comprehensive assessment of the overall state of readiness for the entire class of *San Antonio* (LPD 17) landing platform dock amphibious ships. LPD 17 class ships have experienced numerous issues, both under construction and while in service. *USS San Antonio,* which was "shelved" for most of 2010 for repairs on critical systems, will miss its next deployment, forcing the Navy to alter deployment patterns of other ships. *USS Mesa Verde*, which just returned in August 2010 from a 35,000-mile deployment to the Persian Gulf, will now substitute for *USS San Antonio* in its scheduled summer 2011 deployment.[47]

The review will undertake a critical analysis of the ship's main propulsion diesel engine, engineering control system, cooler, couplings and lube oil. Other issues to be addressed include shipboard manning and manpower related to maintaining LPD 17 equipment and systems, the adequacy of shore-based infrastructure support, spare parts support, and adequacy of maintenance resources. Finally, a key element of the LPD 17 task force assessment will be to

develop recommendations that will benefit ships under construction or still to be constructed in future years.

Aegis Ballistic Missile Defense (BMD) System Readiness Task Force. This task force was established in August 2010 by Commander, Naval Surface Force, Pacific Fleet, to conduct a "wholeness" readiness assessment on the two BMD versions of the Aegis weapon system: Baseline 3.6.1, which is already in service; and Baseline 4.0.1, which is a planned upgraded version. This task force faces additional high-level scrutiny inasmuch as Aegis BMD is the near-term centerpiece of the Obama Administration's Phased Adaptive Approach (PAA) strategy for regional missile defense. [48] A final report will be delivered in March 2011.

While the first readiness task force addressed larger issues impacting both the SPY-1 radar and Aegis weapon system, generally, this group's focus is solely on the Aegis BMD mission and the specific equipment and personnel issues required to ensure the Navy can completely man and sustain both 3.6 and 4.0 Aegis BMD versions. Significantly, the review will also assess relevant manning and support issues associated with the "Aegis Ashore" concept, where improved versions of the SM-3 missile will be deployed on land at various locations in Europe in a BMD role, as called for in the Administration's PAA strategy.

SSLCM to SURFMEPP

The establishment of the SSLCM Activity in May 2009 has been one of the most significant success stories in reversing the challenges in surface force readiness. The SSLCM Activity represented a major paradigm shift in how maintenance and modernization of surface ships were planned, budgeted and executed. At its core, the SSLCM Activity injects discipline and data into a system that had been lacking in both attributes for some time. Beginning with essentially a blank sheet of paper, the SSLCM Activity has made enormous progress in laying the necessary foundation to get the Surface Fleet to the next stage in the long-term management and oversight of maintenance and modernization. No longer is the watchword simply about getting ships underway to deploy overseas. Now, with the initial success afforded by the SSLCM Activity, the sharpened focus is on achieving the expected service lives of the ships and how the service gets there from here.

With a staff of about 100 personnel co-located with the fleet in Norfolk, Virginia, the SSLCM Activity represents a sea change in how operations and maintenance business is conducted across surface warfare. For the first time, there is a holistic, integrated view across the entire spectrum of surface fleet maintenance. This more in-depth assessment will extend from the fleet level, down to specific ship classes and eventually to individual ships. Even more significant, this level of understanding and depth of technical acumen is still growing and will continue to do so for several years to come.

Unlike its counterparts in the submarine and aircraft carrier communities, surface warfare historically has had no single entity responsible for understanding the long-term impact of ship service life if maintenance were postponed or if needed modernization were delayed. No single organization was responsible for pulling together the technical requirements underpinning the need for surface maintenance and the impact of maintenance that was postponed or allowed to

slide out of the budget and then essentially become lost in the system. There was no single entity analyzing how lost maintenance was creating a bow wave of future costs and how this haphazard process might be negatively affecting the overall health or long-term service life of any ship. Lack of technical documentation to buttress justification for maintenance funding in yearly budget cycles also hurt surface warfare, especially in comparison to the level of data that the Navy's carrier and submarine forces routinely had available.[49]

From its genesis, the SSLCM Activity took on responsibility for launching several significant initiatives that will serve as planning pillars for ship maintenance of surface ships well into the future. One of these efforts is the creation of Technical Foundation Papers (TFPs) for each class of ships. TFPs will play a significant role in documenting and understanding and providing transparency into the health of every surface ship class. They will help in the budget process, documenting where the maintenance dollars need to be spent and why. The TFPs are already playing a key role in the decision-making leading to the formulation of the service's Program Objective Memorandum for fiscal year 2013, where the process documented more than 74,000 man hours of maintenance requirements for *Arleigh Burke* (DDG 51)-class destroyers, alone. The TFP defines the maintenance requirement for the life of the ship class to ensure that ships get the right maintenance at the right time. These documents will be reviewed on a regular basis to ensure plans stay on track. Any deviations are quickly noted and their long-term implications to the overall maintenance health of the ship class will be clearly detailed. As of the late fall 2010, the SSCLM Activity had completed TFPs for DDG 51 destroyers, *Ticonderoga* (CG 47)-class cruisers and *Wasp* (LHD 1)-class amphibious assault ships. Next in line are TFPs for LPD 17-class amphibious ships and the Littoral Combat Ship (LCS) classes, followed by the mine countermeasures ships and the Navy's *Cyclone* (PC 1) coastal patrol craft.

Equally important is the formulation of another documentation set called Ship Sheets. These were launched by the SSLCM Activity, and their objective is to get the detailed maintenance and modernization transparency down to the individual ship level. With the development and expansion of these detailed documents, no longer will maintenance on a ship be lost if it was postponed or delayed. These Ship Sheets will track both the maintenance and the impact on ship service life by individual hull, calculating the cost of maintenance and the backlog of cost per ship if maintenance were deferred. In fact, the data contained on the Sheets will be even more powerful and refined—down to the man hours of labor required per hull across the Navy's future year defense plan. Through the end of 2010, Ship Sheets had been developed for 29 DDG 51 destroyers.

The SSLCM Activity's initial success has resulted in the organization being elevated to a new, expanded entity called the Surface Maintenance Engineering Planning Program (SURFMEPP), which was approved in September 2010 by CNO Admiral Roughead and Undersecretary of the Navy Robert Work. SURFMEPP officially stood up in November 2010 and its very existence marks a "vital and significant revolution" in the future of Surface Ship maintenance, according to VADM McCoy. "This is not about a name change."[50] The new organization is already serving as a catalyst in the budget process by ensuring that critical information on ship health is part of the decision-making process. Previously, the lack of good data has hindered the surface force in justifying increases in resources. "Without that technical underpinning, no money comes, because you can't justify the maintenance," Vice Admiral Kevin

McCoy noted.[51] That vital information will now be an integral part of the service's annual budget and planning processes.

Creation of SURFMEPP was one of the key recommendations of the FRP Report, which urged its immediate formation in order that maintenance and modernization plans for all classes of surface ships could proceed expeditiously: "With many of our ships at the 10-15 year point of commissioned service, the pace of SURFMEPP activity must proceed with a sense of urgency."[52] This urgency is being driven by the fact that 15 years is considered the mid-point in a ships service life. If the Navy desires to materially improve its ability to reach full 30- or 35- or 40-year service lives, then now is the time to begin seriously addressing the health and overall condition of any ships' many complex systems.

SURFMEPP will quickly build on SSLCM's success and will grow to an organization of about 200-250 personnel. Most importantly, Navy leadership is committed to growing these functions and processes. The new organization will face a daunting task—managing the maintenance and modernization for 11 classes of ships. This is a much more challenging management issue than that faced by either the aircraft carrier or submarine maintenance models on which SURFMEPP is based, since their inventory of different classes is much more limited. But drawing on the best practices from the long-established Submarine Maintenance Engineering Planning and Procurement organization and the Carrier Planning Activity, SURFMEPP's learning curve should be significantly flattened. Officials from all three organizations are already crafting a new maintenance alliance to share lessons learned, reduce costs and align their processes.[53]

When fully staffed by mid-2011, SURFMEPP will be capable of seamlessly and comprehensively addressing the requirements, programming, planning, budgeting and resources issues challenging surface readiness. It will be the critical node for developing deep technical expertise and data on the health of the surface force that will help to more closely link the Navy's OPNAV headquarters staff with NAVSEA and the fleet. SURFMEPP will marshal the vast reams of technical data collected to then "lean" into the requirements and acquisition processes. As SURFMEPP develops a history of the performance of numerous ship systems and components, this valuable information data set could be made available to the Navy's acquisition program executive officers to ensure hard-earned maintenance lessons from daily fleet use are built into new ship designs from the keel up. Providing this type of information could eventually be one of the most valuable missions for SURFMEPP.[54]

"We simply said we're going to do for our surface ships exactly what we do for our aircraft carriers and submarines," McCoy explained, referring to a "three-phased process that starts with a rigorous, engineered class-maintenance plan."[55] The second phase entailed closer monitoring of all surface ships. "One part is a formal monitoring where we partnered with the American Bureau of Shipping to do five or six thousand ultrasonic tests on our ships," McCoy noted. "In addition, we built a four-phased readiness program through the [Regional Maintenance Centers] where we're putting our ships into a monitoring program to feed the class-maintenance plans."

"Finally," McCoy concluded, "we need a more robust waterfront organization to support our surface ships every day. We've received funding to re-grow the RMCs, and do the right

fundamental engineering, wrench-turning and needed structural repairs. We are advocates for shipbuilding and how to get ships to their full service life. The debate is over on how we are going to do surface maintenance. Now we are going to carry out the plan with rigor."

"SURFMEPP is about getting the maintenance requirements right," McManamon underscored. "Technical foundations papers are being done for each ship class. The model for these papers has been taken directly from the submarine community which looks at the entire life cycle, looks at engineering, and budgets appropriately for the class maintenance plan." Recent improvements implemented or in progress include updates to preventative maintenance systems; development of paints requiring fewer applications; a water-tight door pilot study; delivery of anti-corrosion protective covers; and standing up the Corrosion Control Assist Teams establishment.

The Way Ahead

While it will take some time for current readiness trends to be reversed, clearly the Navy has begun to turn a sharp corner by putting in place a series of forward-leaning initiatives and efforts. Committing a greater share of increasingly scarce resources to those efforts should yield increased readiness levels for the fleet in the long-term. Senior leadership attention and commitment to these efforts continues to intensify. In his Guidance for fiscal year 2011, for example, the CNO listed "maintaining warfighter readiness" as one of his four top priorities. Admiral Roughead also pointed to the Fleet Readiness Enterprise (FRE) as key to significantly improving the Navy's ability to match capable ships with Combatant Command requirements.[56] In an increasingly constrained budgetary environment, the Navy must continue to seek new ideas and new ways of doing business in order to remain relevant and to ensure its platforms are well maintained and modernized for today's missions and tomorrow's missions and tasks.

Evidence of this search for different solutions to overcome operational challenges and improve readiness continues. The Fleet Forces Command and U.S. Pacific Fleet have issued new guidance, with CNO approval, to strengthen and streamline their readiness chains-of-command by clarifying the roles and responsibilities of the Fleet Type Commanders.[57] Under this guidance, a new Fleet Integration Executive Panel, co-chaired by the respective commanders of Fleet Forces Command and U.S. Pacific Fleet, will replace the Fleet Readiness Enterprise. This change is not a negative reflection on the FRE's role or success, but is the means to sharpen its mission to focus on integration across two fleets rather than individual warfare areas.[58]

Facing a significant challenge in the long-term health of its Surface Force, Navy leaders have initiated a bold and forward-leaning set of initiatives designed to quickly stop and reverse the erosion of readiness standards and material readiness. Buttressed by an equally strong and sustained infusion of capital resources, these changes, coupled with increased leader attention and a greater commitment to alter the force's maintenance culture, should ensure that the overall health of the Surface Force current, near-term and future readiness is sustained. With new organizations like SURFMEPP in place to detail the impact of missed maintenance on individual ships, and a Navy-wide focus on squeezing the most service life out each warship, the service will be able to leave today's maintenance challenges in its wake as it sails into a future that will

surely present new missions and new challenges for a service that is always heading into harm's way.

Endnotes

[1] The research and production of this report were undertaken for the Director, Surface Warfare (SEA 21/21A), Naval Sea Systems Command, by the National Security Programs group of Gryphon Technologies LC. SEA 21 is responsible for all in-service maintenance and modernization support to non-nuclear surface and amphibious warships, vessels and craft.
[2] "Fleet Review Panel of Surface Force Readiness" (Balisle Report), prepared for the Commander, U.S. Fleet Forces Command, and Commander, U.S. Pacific Fleet, February 2010.
[3] Admiral John Harvey, Commander, Fleet Forces Command, testimony before the U.S. Congress, House, Armed Services, Readiness and Seapower Subcommittees, 28 July 2010.
[4] "Surface Navy Association Kicks Off Symposium," *Navy News Service*, 11 January 2011.
[5] "CNO Guidance for 2011: Executing the Maritime Strategy," Office of the CNO, October 2010, p. 5.
[6] Interview with Tom Gallagher, Deputy Head, Surface Ship Life Cycle Management Activity (SSLCMA), 10 September 2010.
[7] Gallagher interview; SEA 21 Memo establishing SURFMEPP.
[8] Vice Admiral Kevin McCoy, Commander, Naval Sea Systems Command, quoted in "Navy Establishes New Surface Ship Maintenance Activity," NAVSEA Public Affairs Office, 9 November 2010; and William H. McMichael, "New Command Marks Latest Effort to Improve Surface Fleet's Readiness," *Navy Times*, 9 November 2010.
[9] Gallagher interview, op.cit.; Balisle Report, op.cit., p. 35.
[10] Darren Lake, "SNA Symposium 2011: Maintenance Key to USN Strategy," Shepard Group UK, 12 January 2011.
[11] Remarks of Captain Timothy Corrigan, Director, SSLCMA, at Fleet Maintenance and Modernization Conference, Virginia Beach, Virginia, 4 September 2010.
[12] Admiral Gary Roughead, remarks to the Navy League of Denver, CO, 24 August 2010.
[13] "The Navy at a Tipping Point: Maritime Dominance at Stake?" Center for Naval Analyses, March 2010, p. 7. The report specifically questions how sustainable the high deployment percentage is into the future. See also, Captain George Galdorisi, U.S. Navy (retired), Antonio Siordia and Scott C. Truver, "'Tipping' the Future Fleet," U.S. Naval Institute *Proceedings*, October 2010, pp. 16ff.
[14] Christopher Cavas, "U.S. Navy Prepares to Say No: Quick Response Policy is Wearing Out Ships, Crews," *Defense News*, 27 September 2010, p. 1. Admiral John Harvey, Commander, Fleet Forces Command, acknowledged his concern about the long-term impact on ship life if the Navy continues operating the fleet at historically high deployment rates.
[15] Balisle Report, op.cit.
[16] Admiral Harvey, House Armed Services Committee, 28 July 28 2010; and Christopher Cavas, "Interview: Admiral John Harvey," *Defense News*, 6 October 2010.
[17] Richard K. Betts, "Military Readiness: Concepts, Choices Consequences," The Brookings Institution, 1995, p. 32.
[18] "Interview: Admiral John Harvey," *Defense News*, op.cit.
[19] Balisle Report, op.cit., p. 43.
[20] Balisle Report," op.cit., p. 14. "CNO Weighs in on Cammies, Manning and More," *Navy Times*, 20 September 2010, p. 23.
[21] "NAVSEA Discusses Sustaining, Building the Fleet at SNA Symposium," Washington: DC, NAVSEA Public and Congressional Affairs, 14 January 2011. Admiral McManamon is the NAVSEA Deputy Commander, Surface Warfare, SEA 21.
[22] Sean Stackley, Assistance Secretary of the Navy, Research Development and Acquisition, remarks to National Defense Industrial Association, 30 September 2010.
[23] "NAVSEA Discusses Sustaining, Building the Fleet at SNA Symposium," op.cit.
[24] Admiral Gary Roughead, remarks to the Surface Navy Association Symposium, 14 January 2010.
[25] Rear Admiral Thomas Eccles, Chief Engineer, Naval Sea Systems Command (SEA 05), at Fleet Maintenance and Modernization Conference, Virginia Beach, Virginia, 14 September 2010.
[26] Roughead, Surface Navy Association, op.cit.; Harvey, testimony to HASC, op.cit.; and Darius Jackson "Kearsarge Group, Marine Unit Arrive for Pakistan Relief," *Defenselink*, www.defense.gov, 16 September 2010.

[27] Balisle Report, op.cit., p. 6.
[28] Balisle Report, op.cit., p. 35.
[29] McCoy, Fleet Maintenance and Modernization Symposium, op.cit.
[30] "Revision of COMPACFLT and USFLTFORCOM Missions, Functions and Tasks." Message from Commander, Fleet Forces Command and Commander, U.S. Pacific Fleet, 10 October 2010.
[31] Harvey, 28 July 2010, op.cit.
[32] "Fleet Readiness Panel Senior Leadership Oversight Council Charter" 30 December 2010
[33] Gallagher interview, 10 September 2010, op.cit.
[34] Admiral John Harvey, Commander, Fleet Forces Command, remarks to Fleet Maintenance and Modernization Conference, Virginia Beach, Virginia, 14 September 2010; Balisle Report, p. 7.
[35] Comments of Rear Admiral Thomas Moore (OPNAV N43), at Fleet Maintenance and Modernization Conference, Virginia Beach, Virginia, 14 September 2010.
[36] Most of the reduced-manning initiatives in recent years, including the SMART SHIP program, focused on reducing manning of in-service ships through the introduction of advanced technologies and revisions to shipboard policies. The question was: "If we incorporate this technology or we make this change to process and procedure, how many people can we get off the ship?" Contrast this with the *Zumwalt* (DDG 1000) destroyer program. Well before any steel had been cut, the Navy started with "zero manning" and conducted detailed and exhaustive top-down functional requirements analyses of needed operator, maintainer, and decision-maker tasks, which translated into optimal shipboard manning, personnel skills and end-strengths. Moreover, DDG 1000 was the first major combatant to have an explicit Key Performance Parameter (KPP) for manpower. The goal of the "optimal" (as opposed to "minimal" or "reduced") manning initiatives is to have no fewer or no more crew than needed to operate, maintain and fight the ship safely.
[37] Balisle Report, op.cit., p. 11.
[38] Balisle Report, op.cit., p. 13.
[39] Harvey, House Armed Services Committee, 28 July 2010, op.cit. Harvey added that he was not convinced that the shore-based equation is fully understood.
[40] "CNO Weighs in on Cammies, Manning and More," op.cit., p. 23.
[41] "Surface Ship Material Readiness," Report to *Congress*, op.cit., *pp*. 7-9.
[42] Ibid., p. 11.
[43] Comments of Rear Admiral James McManamon, Deputy Commander for Surface Warfare (SEA 21), Naval Sea Systems Command, at Fleet Maintenance and Modernization Conference, Virginia Beach, Virginia, 14 September 2010.
[44] "Final Report Aegis/SPY Radar Readiness Task Force Final Report," April 2010, p. 11.
[45] Memo, Commander, Naval Surface Forces, Mine Countermeasures Ships Readiness Task Force, 22 February 2010.
[46] *21st Century U.S. Navy Mine Warfare: Enduring Global Access and Commerce* (Washington, D.C.: U.S. Navy, June 2009), p. 27.
[47] Christopher Cavas, "U.S. Navy Amphib San Antonio to Miss Deployment," *Defense News.com*, 14 October 2010.
[48] *At Sea…On Patrol: Aegis Ballistic Missile Defense Program Review 2011*, (Washington, D.C.: U.S. Missile Defense Agency, January 2011), pp. 1, 3, 5. The 2011 annual Aegis BMD *Program Review* has comprehensive information about the strategic framework for ship-based BMD, regional and global threats, systems capabilities, tests and real-world contingencies, current and planned upgrades to the Aegis BDM cruisers and destroyers, and the "Aegis Global Enterprise."
[49] Gallagher interview, op.cit.: "Not having requirements in place meant that we could not defend. When we got to the budget trough we would ask for 5 percent more without being able to give any detail."
[50] "Navy Establishes New Surface Ship Maintenance Activity." NAVSEA Public Affairs release. November 9, 2010; "New Command Marks Latest Effort to Improve Surface Fleet's Readiness," William McMichael, Navy Times, November 15, 2010, page 10.
[51] McCoy, Fleet Maintenance and Modernization Conference.
[52] Balisle Report, p. 35-36; McManamon remarks at Fleet Maintenance and Modernization Conference.
[53] Corrigan interview.
[54] Gallagher interview: "This is a growth industry for us."
[55] "NAVSEA Discusses Sustaining, Building the Fleet at SNA Symposium," op.cit.
[56] "CNO Guidance for 2011: Executing the Maritime Strategy," October 2010, p. 12.

[57] "Commanders Blog" Commander, Fleet Forces Command, 6 October 2010; "Revision to COMPACFLT and USFLTFORCOM Missions, Functions, and Tasks" message, 10 October 2010.
[58] "Commanders Blog" Commander, Fleet Forces Command, 6 October 2010; Philip Ewing, "Fleet Forces Boss Realigns Coastal Type Commanders," *Navy Times*, 18 October 2010, p. 21.